Explaining the time series of stock returns: comparative study on the Moroccan market

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Abstract

Objective: In this paper, we test and compare the explanatory power of the two asset pricing models: the conventional CAPM and the empirical Fama and French three-factor model (1993) in the Moroccan stock market.

Method: According to the Fama and French (1993) methodology, we analyze monthly data of non-financial companies covering the sample period from July 2012 to June 2020. However, we choose the 2x2 approach to form portfolios.

Results: The main findings support the superiority of the Fama and French three-factor model. The mimic risk factors pertained to the size and the book-to-market ratio have a significant role in explaining the Moroccan returns. Moreover, results show the existence of weak value effect but significant size effect. Despite the preeminence of the Fama and French model in describing the time-series of sock returns, the model leaves an unexplained fraction of the variation of Moroccan stock returns.

Originality/Relevance: Our study remains one of the rare studies to focus, first and foremost, on the Moroccan stock market. Its relevance lies in the longer study period compared to previous scarce studies. Moreover, we adopt a different approach from that of the original article of Fama and French (1993). The results of the study would have considerable managerial implications, particularly in terms of portfolio management and the assessment of the cost of equity of Moroccan companies.

Keywords: CAPM, Fama and French three-factor model (1993), Moroccan market, time series data.

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Explication des rendements des titres en séries chronologiques : Etude comparative sur le marché marocain

Résumé

Objet : Dans cet article, nous testons et comparons le pouvoir explicatif des deux modèles d'évaluation des actifs financiers : le MEDAF et le modèle à trois facteurs de Fama et French (1993).

Méthodologie : En respectant la méthodologie de Fama et French (1993), nous analysons les données mensuelles des entreprises non financières s'étalant sur la période de juillet 2012 à juin 2020. Nous choisissons, cependant, l'approche 2x2 pour constituer les portefeuilles.

Résultats : Les principaux résultats soutiennent la supériorité du modèle à trois facteurs. Les facteurs taille et *book-to-market* jouent un rôle important dans l'explication des rendements des titres marocains. En outre, les résultats affirment la présence d'un effet *book-to-market* faible mais d'un effet taille significatif. Malgré la prééminence du modèle de Fama et French dans la description de la série chronologique des rendements des actions, le modèle laisse une part inexpliquée de la variation des rendements des titres marocains.

Originalité : notre étude est demeure l'une des rares études à s'intéresser, tout d'abord, au marché boursier marocain. Sa pertinence réside dans la période d'étude plus étendue par rapport aux rares études précédentes. De plus, nous adoptons une approche différente de celle de l'article original de Fama et French (1993). Ainsi, les résultats de notre étude auraient des implications managériales considérables, notamment en termes de gestion de portefeuille et d'évaluation du coût des fonds propres des entreprises marocaines.

Mots-clés : MEDAF, le modèle à trois facteurs de Fama et French (1993), marché marocain, séries chronologiques

Introduction

Fama and French (1993) developed an alternative model as a response to the several empirical evidence that CAPM (Sharpe, 1963, 1964) performed poorly in capturing the variation in stock returns. Although, the CAPM is the best-known and increasingly commonly used valuation model for its rigorous and simplicity construction, there is general agreement that the model has a relative empirical flaw. While retaining its main ideas, several researchers are attempting to revisit the model according to the fundamental approach which adopts a more pragmatic view of the markets seems to respond well to the imperfections of the CAPM. Its principle is to make the return of the security depend on its own attributes, which are supposed to reflect part of the risk of the company. The Fama and French (1993) model includes two additional risk factors to the CAPM beta. Known in the finance literature as the three-factor model, Fama and French (1993) argued that the market factor, the mimicking returns pertained to size and the mimicking returns pertained to book-to-market ratio are the three factors describing the variation in common stock returns. This developed combination turns out to be the most discussed financial asset valuation model in recent years. It is part of a "new finance" that integrates both theories and empirical observations [Cochrane (1999), Aftalion (2003)].

Many researchers compared the descriptive power of the competing models in developed markets. However, literature regarding the usefulness of the models in emerging markets sparse. Special attention is paid to Asian markets (Indonesia, India, Amman, Pakistan...) but very few studies have explored African emerging markets (apart from South Africa). There is a notable gap in North African markets literature. Our paper is a contribution to this literature with a particular interest on one of these markets: the Moroccan market which is the first stock exchange in the Maghreb and West Africa, and the second in Africa, behind Johannesburg (EIB 2022)[2]. Aguenaou et al.'s (2011) study is the only one carried out in the Moroccan market. Considering a longer sample period, our paper tried to answer two key questions:

1) By comparing the CAPM and the Fama and French three-factor model performances, which model best explains the variation in Moroccan stock returns?
2) Are size and B/M effects existing in Moroccan stock returns?

The competing models are tested on chronological data and their explanatory power is compared over a period from July 2012 to June 2020 covering all stocks (non-financial firms) quoted on the Casablanca stock exchange[3].

The paper proceeds as follow: first, we report a succinct literature review of studies comparing CAPM and the Fama and French three-factor model. Next, we present the study's sample and methodology. The results obtained are, finally, exposed and discussed.

1. Review of literature

While the CAPM is still the most widely accepted description for the relationship between stocks' expected returns and systematic risk, empirical studies found contradicting evidence. Therefore, various are models replying to CAPM persistent imperfections but the three-factor model of Fama and French (1993) is by far extensively used. This latter has been largely studied on the American market following the publication of the two original studies by Fama and French (1992, 1993). The first results seem to confirm the observations of the two authors. The empirical model is then examined on various

[2] According to EIB investigation « *la finance en Afrique, naviguer en eaux troubles* » (2022),"In North Africa, Morocco takes the lead in terms of the equity of market capitalization in the Maghreb (USD 65.6, 57.1% of GDP), followed by Egypt (USD 41.4 billion, 11.3% of GDP) and Tunisia (USD 8.5 billion, 20.6% of GDP). In sub-Saharan Africa, South Africa has the highest market capitalization (USD 1 trillion, 313.5% of GDP), followed by Nigeria (USD 56 billion, 12% of GDP), Kenya (USD 21.4 billion, 13.1% of GDP) and Ghana (USD 9.2 billion, 13.5% of GDP)".

[3] Our study's tests are carried out via the Eviews 10 software.

samples, according to different methodologies, data sources and observation periods. The work and tests concerned, first, the developed markets, then, were extended to the markets of emerging countries. The synthesis of the review of the literature seems to approve both, criticize, and contradict Fama and French's observations and there is no point in making an exhaustive literature review here.

Griffin (2002) examined the Fama and French model (1993) in UK, Japan and Canada and highlighted the significant contribution of the value and size factors to performance of the model. In its turn, the study led by Hu (2003) provide the same results using data for NYSE, AMEX and NASDAQ equity markets. In another identical study, Charitou and Constantinidis (2004) confirmed the preeminence of the Fama and French model (1993) in describing the variation in returns comparing to the CAPM in Japan market. Similarly, in the Australian market, Gaunt (2004) found that the Fama and French three-factor model outperforms the one-factor model in capturing the variation in common returns. The size and book-to-market factors have a pertinent contribution in describing the Australian returns. The author identifies a slightly book-to-market effect but a statistically pertinent size effect. For their part, Bhatnagar and Ramlogan (2012) in UK and Miao and Yi (2013) in US, by comparing the two models, emphasize the ability of Fama and French model (1993) in describing stock returns.

The same results are found in several emerging markets but not as the same magnitude as those documented in the developed markets. Silva (2006) and Pasaribu (2009) report that the two added factors make a great improvement in capturing the variation in returns, respectively, in Brazilian and Indonesian stock markets. Once the model is tested in the Mauritius market, Bundoo (2008) obtain the same findings. In the same perspective, Ajlouni and Khasawneh (2017) and Shah *et al.* (2021) find that the Fama and French three-factor model works better than the single-factor model CAPM in Amman and Pakistan markets respectively.

However, in Singapore, Hong Kong and Taiwan markets, Shum and Tang (2005) verified the applicability of the three-factor model (1993) and concluded that the market factor was the fundamental explanatory factor of common returns. The contribution of the book-to-market and the size variables is restricted and even seems negligible in certain cases. These results are confirmed by Naughton and Veeraraghavan (2005) in Indonesia, Singapore and Taiwan. The two authors argued that the multifactor approach is not evident in these markets and that the CAPM beta coefficient is the only factor that significantly explains the variation of common returns. For them, the descriptive ability of book-to-market and size factors remains very low and varies according to the markets observed. The same result is confirmed by Mobin and Sanjay (2019) who documented the wellbeing of CAPM. The authors support the vigorousness of the CAPM on the Indian market despite the descriptive power of the Fama and French model (1993).

Furthermore, Classens *et al.* (1995), while studying twenty emerging stock markets, point out that despite the Fama and French three-factor model outperforms the CAPM, a large part of the variation in stock returns remains unexplained by the model. These conclusions are in line with Nartea *et al.* (2009) in New Zealand, Dolinar (2013) in Croatia and Sutrisno and Nasri (2018) in Indonesia. Similarly, Karp and Vuuren (2017) conclude that both models perform relatively poorly in the Johannesburg stock exchange. For them, these results may be influenced by restrictions of market liquidity, inappropriate market proxy values, and more emerging market specificities. When the conditions and characteristics of the studied markets change significantly, then divergent results are observed in the Fama and French model (1993) tests. Studies on recent periods or on emerging markets do not quite confirm the first observations on the American market.

For their part, Barry *et al.* (2002) corroborate the existence of a significantly positive relationship between returns and book-to-market and a negative relationship between common returns and size. But this seems less obvious in the sense that the results are dependent on extreme observations and are not significant on aggregate data. Classens, Dasgupta and Glen (1995, 1998) notice that the size

effect, unlike the value effect, is not significant in different emerging markets. Similarly, Zaremba and Konieczka (2017) find strong evidence for value effect but only weak evidence for size effect. Most of studies on emerging markets agreed the ineffectiveness of the size effect comparing to the value effect [Fama and French (1998), Barry *et al.* (2002), Eraslan (2013)]. However, Djajadikerta and Nartea (2005) find a weak book-to-market effect contrary to a pertinent size effect in the New Zealand market. The same findings are confirmed in twelve emerging markets studied by Leite *et al.* (2018).

In the case of Moroccan market, Aguenaou *et al.* (2011) study the descriptive power of the three-factor model (1993). However, the authors integrate both non-financial and financial companies (banks, financial institutions, and assurance companies) in the studied sample. This is not consistent with the Fama and French methodology (1993). As Fama and French (1993) argued, those stocks are excluded because of their high financial leverage, so it becomes difficult to compare their book-to-market ratios.

2. Database and methodology

2.1. Database

For our paper, the data are from the Casablanca stock exchange website, augmented with Refinitiv's database. The data set of this study concern all stocks traded in the Moroccan market during the period from July 2012 to June 2020. However, a filtering process is performed according to Fama and French (1993) methodology. Our initial sample includes 75 stocks. Only non-financial companies with market and countable data availability are used. Furthermore, stocks with monthly returns for only one year and/or negative book-to-market are eliminated. The final sample consists of 52 Moroccan companies.

Given the availability of data, the considered sample is not cylindrical. The number of stocks observed increase from year to another (see Table1).

Table 1: Size of the studied sample.

Year	Number of stocks
2012-2013	47
2013-2014	48
2014-2015	49
2015-2016	50
2016-2017	51
2017-2018	52
2018-2019	52
2019-2020	52

The rate of return for each stock includes, for each month, capital gain and dividends yield. As a proxy for the risk-free rate, the study uses the monthly equivalent rate to 13 weeks Treasury bill rate [4] available on the Bank Al-Maghrib[5] website. As a proxy for the market rate, we consider all sample stocks' value-weighted returns.

[4]For the risk free rate, 13 weeks treasury bill rate is used in several studies as in the Australian stock exchange [Nguyen *et al*. (2009), Akhtaruzzamanand *et al.* (2014), Chai *et al*. (2019)] and the French stock exchang (Trimech *et al.*, 2009).
[5]The Bank Al-Maghrib is the central bank of the Kingdom of Morocco.

The main variables taken into account in this paper are market value of equity known as the size and book-to-market ratio. The market value of equity is defined as the number of shares outstanding[6] multiplied by the adjusting closing price of the month. Concerning the book-to-market ratio, it is estimated as the market-to-book[7] reverse value available in Refinitiv's database.

2.2. Construction of the Fama and French variables

Following Fama and French methodology (1993), the explanatory variables or the independent variables contain the market portfolio and the size and book-to-market ratio mimicking portfolios.

Known as the excess return on the market portfolio ($R_M - R_f$), the market factor is measured as the value weighted return of full sample stocks minus the one-month Treasury bill. The correlation between the return on market portfolio and Moroccan All shares Index (MASI) for the study period is 0.95.

Fama and French (2015a) construct portfolios according to three different approaches[8] and argue that the choice is arbitrary. Because of the limited number of firms traded in the Moroccan market and the availability of data, the mimic risk factor pertained to book-to-market and size are estimated in the basis of 2x2 sort formed portfolios.

Regarding the size, stocks are divided in two classes according to if their market value is lower (S) or higher (B) than the median of the market capitalization of the sample. To form portfolios, we consider the capitalization of June of year (t) for the period from July of year (t) to June of year (t+1).

Regardless of the previous classification[9], based on the median value, two classes of book-to-market value are formed. Stocks whose book-to-market ratios are below the median are grouped in the class of (L)low book-to-market ratio (growth stocks), while stocks whose book-to-market ratios are above the median are groups in the class of high (H)book-to-market ratio (value stocks). As Fama and French (1993), we form portfolios by taking into consideration the book-to-market ratio of December of the year (t-1) for the period from July of year (t) to June of year (t+1)

From the intersection of the preceding independent classification, four portfolios are defined: (S/L, S/H, B/L, B/H). From July of the year t to June of year (t+1), the value weight monthly return is defined, for each portfolio, as shown in the equation below:

$$R_{pt} = \sum_{i=1}^{n} R_{it} * \omega_{it}$$

with,

R_{pt} : is the value-weighted monthly return of portfolio *p* (t);

R_{it} : is the stock i monthly return (t);

ω_{it} : is the monthly proportion of market value of stock i on the value market of portfolio p;

n: is the stocks' number in the portfolio *p*.

[6]Available on the Casablanca stock exchange website.

[7]Market value to book divides the market value of equity over the book value of common equity of a company.

[8]Fama and French (2015) examined if the factor construction may influence tests of asset pricing models. Therefore, they used three approaches: 2x2 sorts, 2x3 sorts and 2x2x2x2 sorts. They noted that the choice of the approach is arbitrary.

[9]According to Fama and French (1993), the methodology of independent double classification reduces the correlation between the explanatory variables pertained to book-to-market ratio and size.

The mimic risk factor pertained to size (*SMB*) is measured each month as the difference between the mean returns on SL and SH portfolios (small stocks) and the mean returns on BL and BH portfolios (big stocks):

$$SMB = \frac{(R_{S/L} + R_{S/H})}{2} - \frac{(R_{B/L} + R_{B/H})}{2}$$

Similarly, the mimic risk factor pertained to the book-to-market ratio (*HML*) is constructed, each month, the mean returns on SH and BH (with high book-to-market) portfolios minus the mean returns on the SL and BL (with low book-to-market ratio) portfolios:

$$HML = \frac{(R_{S/H} + R_{B/H})}{2} - \frac{(R_{S/L} + R_{B/L})}{2}$$

Table 2 summarizes the descriptive statistics of the three-factor model. The correlation matrix reveals that the risk premium for the market factor is negatively correlated to *SMB* (-0.344). However, the market factor is positively correlated to *HML* (0.168). These findings are consistent with Karp and Vuuren (2017) in the South African market, Ajlouni and Khasawneh (2017) in Amman stock exchange and Ali *et al.* (2018) in the Pakistani market. Like Fama and French (1993), *SMB* and *HML* are negatively correlated (-0,38).

The average value for the market factor shows a negative value of -1.795% per month. Fama and French (2012) reported that the estimates of equity premiums are imprecise[10]. Unlike the market factor, the average of the size premium shows a positive value of 0.999% per month. These findings give an initial conclusion at the existence of the size effect. However, the book-to-market factor *HML* produces a negative average premium of -0.285%. The results reflect that growth stocks surpass the value stocks. These findings do not accord with earlier studies carried out in both emerging and developed markets [Fama and French (1998)]. However, given the argument of Ragab *et al.* (2020), the 2x2 sort employing in our paper may be the reason to this negative value [11].

Table 2: Descriptive statistics of the risk factors: $R_M - R_f$, *SMB* and *HML*: July 2012-June 2020 (96 months).

	$R_M - R_f$	*SMB*	*HML*
	Correlation matrix		
$R_M - R_f$	1,000		
SMB	-0.344	1,000	
HML	0.168	-0.182	1,000
	Monthly excess returns		
Mean	-1.795%	0.999%	-0.285%
Standard Deviation	4.145%	4.583%	4.018%
t-stat (mean)	-3.598	-3.298	1.105

Due to our reduced sample of stocks, the dependents variables are defined as stock portfolios returns of the four constructed portfolios S/L, S/H, B/L, B/H. Therefore, the portfolios' value weighted

[10]Fama and French (2012) find that Japan is the exception with a negative excess return of -0.12 % per month. Negative average value is also found by several authors in different markets stock exchange as the Greek stock market (Maris ,2009), the Nairobi stock market (Achola and Muriu, 2016) and the Polish stock market (Zaremba *et al.*, 2019).

[11]In the Egyptian market, Ragab *et al.* 2020 found a negative value premium. They argued that the sorting method of 2x2 may introduce some biais in results.

returns are measured over the 12 months from July (t) to June (t+1). Their composition is reviewed, each year, every month of June.

Table 3, below, exhibits that the SL and BH portfolios contains the lowest average number of stocks. Conversely, the SH and BL portfolios, showing the same average number of stocks, include the highest number of stocks. Like Fama and French (1993), at the level of small (Big) capitalizations, the number of stocks increases (decreases) with the book-to-market ratio. The market capitalization means of the firms in portfolios vary from 328.47 million DH to 14005.43 million DH for the smallest high book-to-market portfolio to the biggest low book-to-market portfolio, respectively. The two variables are negatively correlated. The average size (market capitalizations) decreases (increases) when the average book-to-market ratio of portfolios increases (decreases). Conversely, the average book-to-market ratio increases (decreases) when the average size of securities decreases (increases).

Moreover, the relation between the average returns and book-to-market is reversed for both size group. In every size group, average returns increase as book-to-market falls. The results prove the inexistence of the value effect. Consistent with Ragab *et al.* (2020), growth stocks outperform value stocks within each size group in the Egyptian market. However, within each book-to-market group, the findings highlight a pertinent size effect as reported in the original study of Fama and French (1993). Average returns tend to increase as the size falls. The negative relation between average returns and size is affirmed.

Table 3: Characteristics of the four stock portfolios: July 2012-June 2020 (96 months).

	Book-to-market	
Size	L	H
	Annual average number of stocks	
S	5.875	19
B	19	6.25
	Average capitalizations (Millions DH)	
S	480.90	328.47
B	14005.43	3485.68
	Average book-to-market ratio	
S	0.390	1.218
B	0.323	0.925
	Average monthly excess returns	
S	-0.933%	-1.103%
B	-1.817%	-2.217%
	t-statistic	
S	3.113	1.0109
B	1.386	-0.062
	Standard deviation	
S	5.38%	6.13%
B	4.16%	6.50%

3. Regressions results

The time-series regressions are carried out according to the original methodology (1993). For insights into model performance, we consider slopes, intercepts, adjusted coefficients of determination (R^2) and the t-statistic to compare the descriptive power of each model. The nullity test of the intercepts also makes it possible to confirm the quality of the modeling studied.

3.1. CAPM

For CAPM, the equation of the time series regressions is:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{Mt} - R_{ft}) + e_t$$

With,
R_{pt} : portfolio return for month t;
R_{ft} : risk free rate for month t;
R_{Mt} : the market portfolio return for month t;
α_p: regression intercept for portfolio p;
β_p: regression coefficient for the market factor.
e_t: error estimation.

Table 4 highlights the regression results for CAPM. The intercept terms are indistinguishable from zero and not statistically significant. Bundoo (2008) reports similar findings in Mauritius market. The findings underline that the beta coefficients are all significant, however, the model can capture only 47.25% of all variation in common returns. Ranging from 0.54 to 1.087, the betas of the four portfolios are all significant at 5%. As Fama and French (1993), the size effect is confirmed. The big portfolios' intercepts are negative. While the book-to-market is controlled, abnormal returns increase as size falls. Contrary to the earlier findings concerning the absence of value premium, we notice that low-to-high book-to-market portfolios, abnormal returns increase for the small capitalization classes. However, high book-to-market portfolios underperform low book-to-market portfolios for the big capitalizations group [Bundoo (2008)].

Table 4: CAPM: time series regressions of the four constructed portfolios: July 2012 - June 2020 (96 month).

Intercept (α)				***t-statistic***		
	L	H			L	H
S	0.000	0.003		S	0.79	0.504
B	-0.000	-0.002		B	-0.556	-0.506
beta (β)				***t-statistic***		
S	0,54*	0,778*		S	4.47	5.997
B	0.996*	1.087*		B	87.94	9.318
Adjusted R^2						
S	17%	27%				
B	98%	47%				
Average adjusted R^2	47.25%					
(*) Significant at 5% level						

3.2. The Fama and French three-factor model (1993)

For the three-factor model (1993), times-series regressions are expressed in the equation hereafter:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{Mt} - R_{ft}) + s_p SMB_t + h_p HML_t + e_t$$

with,
R_{pt}: portfolio return for month t;
R_{ft}: risk free rate for month t;
R_{Mt} : return of the market portfolio for month t;
α_p: regression intercept for portfolio p;
β_p: regression coefficient for the market factor;
s_p , (h_p): regression coefficient for the size (book-to-market) factor for portfolio p;
SMB_t, (HML_t): returns of the mimicking portfolios pertained to size (book-to-market ratio) for month t;
e_t: error estimation.

Table 5 highlights the regression findings of the three-factor model. SL and BH show the same intercept term (-0.002). The same result is shown for BL and SH. As observed in the findings of Bundoo (2008), the intercepts are negatively indistinguishable from zero and statistically unsignificant. Once the market factor is the single independent variable in regression equation, the intercepts confirm the size effect. However, contrary to the CAPM regression findings, the size effect is confirmed just for classes with high book-to-market in the three-factor model regression. For the book-to-market effect, as observed previously, abnormal returns decrease as book-to-market falls only for small portfolios.

The addition of the two factors of size and book-to-market makes a valuable contribution in explanation of returns. The average adjusted R^2 is about 82.25% rather than 47.25% for CAPM. Thus, the market factor and the portfolios formed of the mimic risk factors pertained to book-to-market and size performs well in describing the variation of stock returns. For all the portfolios, beta is significant. This is corroborated with Djajadikerta and Nartea (2005) in the New Zealand market. As expected, all portfolios provide statistically significant signs of coefficients (*s* and *h*) at the level of 5%. Referring to small classes, the *s* coefficient is positive and for all the big ones, it is negative. Therefore, the slopes on *SMB* are pertained to size. Similarly, the slopes on *HML* are systematically pertained to the book-to-market. In terms of low book-to-market portfolios, the h coefficient is negative and for the high book-to-market classes, it is positive. Finally, SH and BL earn higher returns on average with an estimation of 99% of R^2 for each one. Our results corroborate with those of Fama and French (1993), Bundoo (2008) and Drew *et al.* (2003).

Table 5: Time series regressions results of three-factor model for the four portfolios sorted on size and book-to-market: July 2012 to June 2020 (96 months).

Intercept (α)				***t*-statistic**		
	L	H			L	H
S	-0.002	-0.000		S	-0.505	-0.577
B	-0.000	-0.002		B	-0.577	-0.505
beta (β)				***t-statistic***		
S	0.873*	1.002*		S	9.602	109.31
B	1.002*	0.873*		B	109.31	9.602
H				***t-statistic***		
S	-0.256*	0.923*		S	-2.863	102.22
B	-0.076*	0.743*		B	-8.487	8.29
S				***t-statistic***		
S	0.755*	0.982*		S	9.165	118.15
B	-0.017*	-0.244*		B	-2.117	-2.959
Adjusted R^2						
S	59%	99%				
B	99%	72%				
Average adjusted R^2	82.25%					
(*) Significant at 5% level						

Conclusion

In the last decades, understanding the return–risk relation in emerging stock markets is an important field of research which is constantly rises. In this respect, our paper is a contribution to the literature on African emerging markets, in particular those of North Africa to show more evidence using data from Moroccan market. The results of the study would have considerable managerial implications, particularly in terms of portfolio management and the assessment of the cost of equity of Moroccan companies.

For the first time in the literature, we test and compare the performance of the conventional one-factor model and the three-factor model of Fama and French (1993) in capturing the variation of all non-financial Moroccan common stocks. Time-series regression tests covered a period from July 2012 to June 2020.

Our results of the regression show that the three-factor model surpasses the conventional one-factor model in describing the Moroccan stock returns. The market factor coefficients' t-statistics were significant under the CAPM, but regarding the average adjusted R^2, the model remains insufficient in describing the variation in returns (R^2= 47.25%). While adding book-to-market and size factors to the market factor, we notice a remarkable increase of the average adjusted R^2 from 47.25% to 82.25%. In addition, the regression coefficients for the three factors (beta, s, h) have statistically significant value.

Therefore, mimicking portfolios pertained to book-to-market ratio and size perform well in capturing the variation in the Moroccan stock returns.

Considering the intercept terms, it would be possible to conclude that even though the superiority of the three-factor model in explaining most of the variation in common stock returns of firms listed in the Moroccan market, there may be a part of missing variation unexplained by the model. Similar findings are observed by Bundoo (2008) in Maurituis market, Dolinar (2013) in the Croatian market and Sutrisno and Nasri (2018) in Indonesia.

Our findings document a poor book-to-market effect nevertheless a statically significant size effect is confirmed. The consistent findings of a weak book-to-market effect or even its absence is, however, contrary to considerable studies veryfing the presence of value premium in both emerging and developed markets. Nevertheless, it is in harmony with the more recent studies of Leite *et al.* (2018) and Ragab *et al.* (2020). Djajadikerta and Nartea (2005) also reported a weak value effect contrary to the significant size effect in the New Zealand stock market. Furthermore, Chen and Zhang (1998) reveal that, in developed markets, value stocks returns are the highest comparing to growing markets even virtually absent in strong markets growth.

The divergence in results may be due to the specific characteristics of the emerging markets. Bakaert *et al.* (1997) and Harvey (2000) argue that these immature markets are described by the very high volatility of their returns and are in low correlation with developed markets. Therefore, the small sample size may influence the results because it becomes difficult to form well diversified portfolios [Djajadikerta and Nartea (2005), Ajlouni and Khasawneh (2017)].

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